OSIRIS-REx™

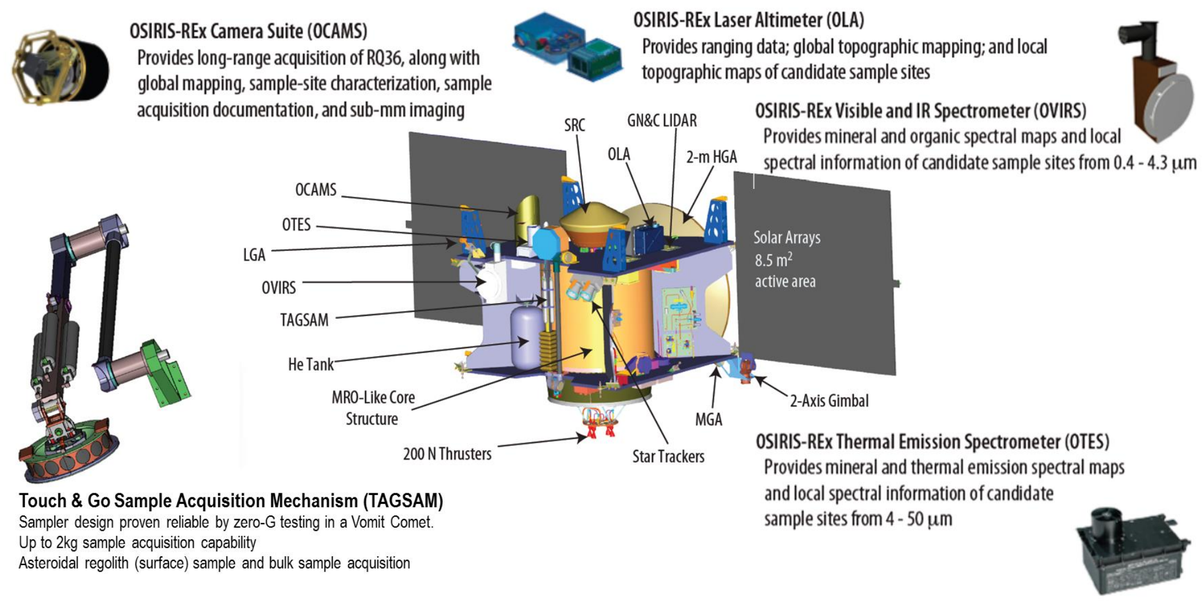
Origins, Spectral Interpretation, Resource Identification, Security, Regolith Explorer

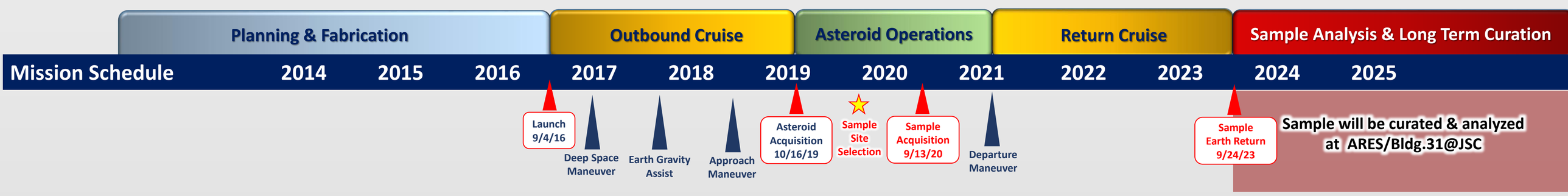
NASA New Frontiers Asteroid Sample Return Mission

Scientists at ARES are preparing to curate and analyze samples from the first U.S. mission to return samples from an asteroid. The Origins-Spectral Interpretation-Resource Identification-Security-Regolith Explorer, or OSIRIS-REx, was selected by NASA as the third mission in its New Frontiers Program. The robotic spacecraft will launch in 2016 and rendezvous with the near-Earth asteroid Bennu, in 2020. A robotic arm will collect at least 60 grams of material from the surface of the asteroid to be returned to Earth in 2023 for worldwide distribution by the NASA Astromaterials Curation Facility at ARES.

The target asteroid Bennu is believed to be a primitive type that is rich in organic matter. Such primitive asteroids contain original material from the cloud of dust and gas that gave rise to our solar system more than 4.5 billion years ago and yield important clues about its formation.

ARES curates seven different types of astromaterials, beginning with the 1969 return of lunar rocks from the Apollo missions and including NASA's recent Genesis Mission solar wind samples and Stardust mission cometary dust samples. Lessons learned at ARES from participating in these previous extraterrestrial sample return missions benefit sample protection, contingency planning and contamination control knowledge.





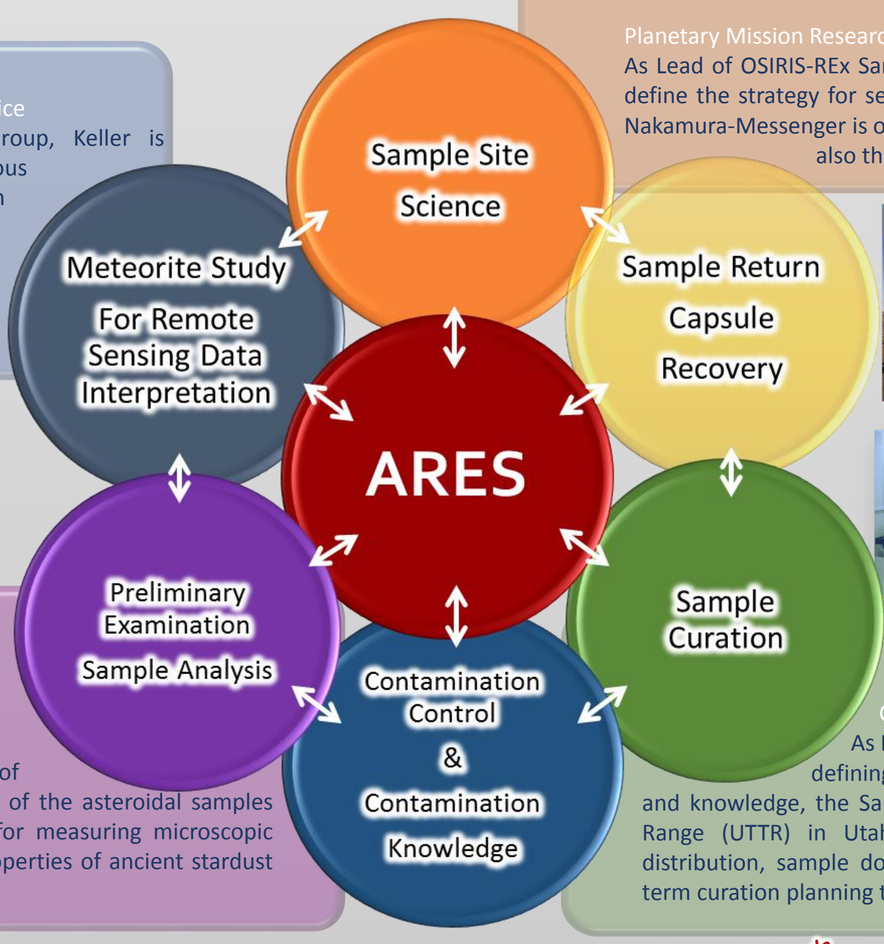
ARES Scientists Lead Key Science Working Groups for OSIRIS-REx

Currently 78 science team members in OSIRIS-REx. ARES members lead 4 important science projects.

Lindsay Keller

Planetary Scientist, Deputy Manager, Astromaterials Research Office

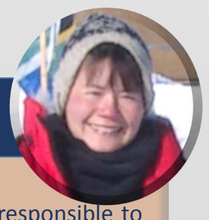
As Lead of OSIRIS-REx Carbonaceous Meteorites Working Group, Keller is responsible for the analysis of carbonaceous meteorite samples that are analogous to the regolith expected on the surface of Bennu. When the sample returns from Bennu in 2023, Keller will investigate their mineralogy and chemistry at atomic scales using state-of-the-art transmission electron microscopes. The priority science goals of this study include investigating the effect of solar radiation on asteroidal surfaces, the geological history of the asteroid and the nature and origin of the first solar system solids.



Scott Messenger

Planetary Scientist at Astromaterials Research Office

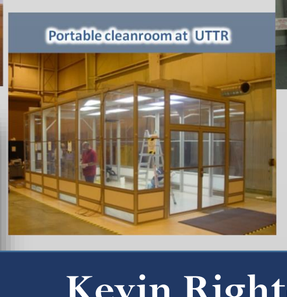
As Lead of Sample Analysis Working Group, Messenger is in charge of establishing contamination knowledge related to flight hardware to ensure the integrity of the collected samples. Messenger is also responsible for developing the sample analysis plan of the returned samples. Messenger will study the isotopic properties of the asteroidal samples with a NanoSIMS ion microprobe, a powerful mass spectrometer for measuring microscopic samples. He will determine the age of the samples and study the properties of ancient stardust grains and organic matter that predate the origin of the solar system.



Keiko Nakamura-Messenger

Planetary Mission Research Scientist at Astromaterials Research Office

As Lead of OSIRIS-REx Sample Site Science Working Group, Nakamura-Messenger is responsible to define the strategy for selecting and characterizing the primary sampling sites on Asteroid Bennu. Nakamura-Messenger is one of the Sampling Site Selection Board member. Nakamura-Messenger is also the deputy curation lead of OSIRIS-REx.

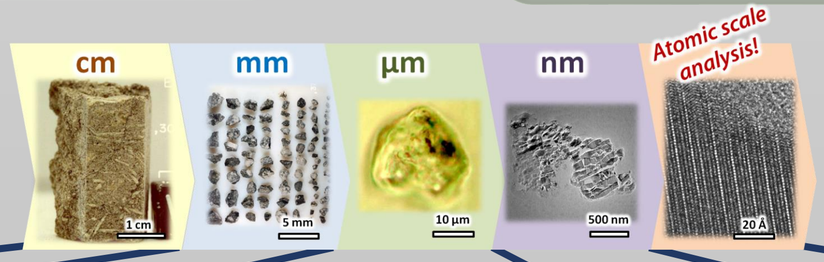


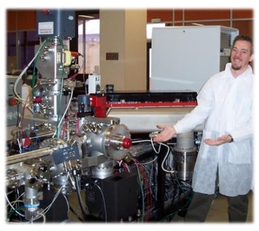
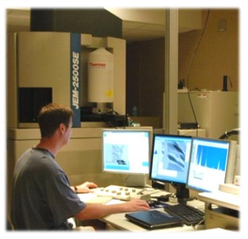
Kevin Righter

Antarctic Meteorite Collection Curator at Astromaterials Curation Office

As Lead of OSIRIS-REx Sample Curation, Righter is responsible for defining curation-related issues for the mission including contamination control and knowledge, the Sample Return Capsule recovery at the drop site Utah Test and Training Range (UTTR) in Utah, UTTR and ARES cleanroom construction, sample handling and distribution, sample documentation (imaging, catalog database development etc), and long-term curation planning to ensure the integrity of the collected samples.

ARES Analytical Capabilities
Just a few examples!



Analytical Technique	Electron Microprobe	Thermal Ionization Mass Spectrometry	Focused Ion Beam	Laser Mass Spectroscopy	NanoSIMS	Transmission Electron Microscope	Next 10 years until Sample Return
Instruments @ ARES							Non-Destructive Techniques Micro-CT installation Micro-XRF Experimental Simulations
Science	Mineralogy Petrology	Isotope Chemistry	Micrometer-Scale Sample extraction	In-situ Organic Compound Imaging	In-situ Nano-Scale Isotopic Imaging	Crystallography Nano-Scale Elemental Mapping	Technology Development